



SUBJECT: **SETTLING P4 FLUORESCENT SCREENS**
Process Specifications

SCHEDULE NO. 1 (P401 SCREENS)

This schedule is superseded by Schedule No. 4 (34-17-14D).

MAY 1955

SCHEDULE NO. 2 (P402 SCREENS by Automatic Dispenser)

- 1. EQUIPMENT As specified in 34-17-14.
- 2. MATERIALS
 - Z623 Zinc Sulfide - Zinc Cadmium Sulfide Suspension.
 - P69B Potassium Sulfate Solution.
 - P264B Potassium Silicate Solution.
 - A609 Ammonium Bifluoride or H7 Hydrofluoric Acid.
 - W7K Distilled, W7J Distilled, or W60D Deionized Water.



AMMONIUM BIFLUORIDE SAFETY PRECAUTIONS: See 33-2-7C.
HYDROFLUORIC ACID SAFETY PRECAUTIONS: See 33-2-7A.

3. PROCEDURE

It is important that the dispenser be maintained in excellent mechanical condition and immaculately clean. Before use the tank is to be filled with the three dispensed liquids and all time and volume settings adjusted and checked by a capable machine attendant. These procedures are covered in Stdzg. Not. 34-17-14.

- a. The normal sequence of operations on the bulb starts with unloading from conveyor and placing in the appropriate wooden tray.
- b. At the dispenser position, the inside of bulb is rinsed on the distilled or deionized water spray device. The bulb is quickly transported to position next to dispenser operator with the face down (inside remains wet).

Note: Step b may be eliminated if bulb has been washed on inside bulb washing machine where the temperature of the tap water rinse is controlled (See 34-17-4J).

c. Dispenser operator then:

- (1) Inserts one of two * lucite-funnels in neck of bulb.
- (2) Marks bulb with hour and minute of dispensing time.
- (3) Transports bulb, face down, to the two-position movable dolly under the dispenser nozzle.
- (4) With funnel under the dispenser nozzle, pushes main starting lever. (The dispenser automatically dispenses the water cushion layer first, then the three liquids from tank simultaneously, and finally the distilled water flush. Quantities are specified under Part 4.)
- (5) Positions movable drip pan to avoid dropping any liquid on outside of bulb from dispenser.

SCALE—

DIMENSIONS IN

UNLESS OTHERWISE SHOWN. DIMENSIONS SHOWN WITHOUT TOLERANCES ARE DESIGN CENTERS

(Continued on Page 2)

6-546-14-60

PCL24549-126EB

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13D26-R1



3. PROCEDURE (cont'd)

- d. The "carrier" operator grasps bulb by the neck from the movable dolly and with a minimum of agitation of the liquid, carries it to a settling table and gently places it face down.
- e. The bulb remains in this settling position for the specified time (see Part 4).
- f. At the end of this period, it is transferred gently and in the same face down position to the tilt table which is set in the horizontal position. The bulb is then fastened to the table by rotating the center screw which draws both clamps inward to the bulb.
- g. This Model 799TT tilt table is semi-automatic in action and operates:
- (1) Set start delay switch at 5 minutes which permits liquid agitation to subside.
 - (2) Pull motor start-reverse handle switch forward which starts the cycle. After 5 minutes delay, the table begins to tilt and over a period of 5 additional minutes fully decants all the liquid, leaving the settled screen. The tilting mechanism stops automatically when a contact actuates a microswitch.
- h. The clamps are then loosened by turning the handle of the center screw and the released bulb is transported, neck down, over the air drying position. This handling insures against any liquid which may remain in the bulb from again coming in contact with the face.
- i. The operator throws the reverse handle switch to the full rear position which brings the tilt table back to its normal horizontal position for reloading.
- j. The air drying with low pressure air from the jet takes 8 to 10 minutes after which the screened bulb is again placed in the tray and transported to the neck washing position.
- k. The neck washing position consists of a frame with top enclosing a plastic jar containing the ~~**3-3.5% ammonium~~ bifluoride solution or 1-1/2% hydrofluoric acid solution. When placed on the frame in the neck down position, the solution contacts the inside and outside of the bulb for a few seconds. A tube through the center of the jar air vents the inside of the bulb permitting the liquid to enter the neck.
- l. The bulb is removed from this solution and placed over the inside-outside water spray rinsing position adjacent. Using a sponge, all marks except identifying information are cleared from the bulb face with the ammonium bifluoride or hydrofluoric acid solution and finally with water.
- m. The screened and cleaned bulb is then returned to the conveyor which carries it to the light box screen inspection position.

SCALE—

DIMENSIONS IN

UNLESS OTHERWISE SHOWN.

DIMENSIONS SHOWN WITHOUT TOLERANCES ARE DESIGN CENTERS

22-508-8-60

PCL13301-121JD

(Continued on page 3)

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13D26



SUBJECT:

SETTLING P4 FLUORESCENT SCREENS
Process Specifications

SUPERSEDES Feb. 23, 1954

4. SCREEN APPLICATION SPECIFICATIONS

Tube Type	Fluorescent Material mg.	Screen Weight mg./sq. cm.	Cushion Water cc.	Z623 at 12.8 mg/cc. cc.	Silicate*16% P264D cc	Sulfate 1-N P69B cc.	Rinse Water cc.	Minimum Settling Time minutes
7DP4	806	3.6	400	63	* 48	100	*182	60
7JP4	687	2.65	1100	53	* 110	300	*228	60
7TP4	794	3.5	400	62	*48	100	*182	60
10BP4A	1602	3.5	1200	125	*132	280	*443	30
12LP4A	2520	3.5	2500	197	*256	350	*414	30
14EP4	2275	4.0	3500	200	*256	350	*414	45
10SP4 ***	1602	3.5	1200	125	*132	280	*443	30

SCALE—

DIMENSIONS IN

UNLESS OTHERWISE SHOWN.

DIMENSIONS SHOWN WITHOUT TOLERANCES ARE DESIGN CENTERS

13-552-2-64

PCL26696-126PS

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SETTLING P4 FLUORESCENT SCREENS

SUBJECT: Process Specifications

SUPERSEDE

Feb. 7, 1955

SCHEDULE NO. 2A (P4O2 Screens by Hand Dispensing)

1. EQUIPMENT As specified in 34-17-14.
2. MATERIALS
 - Z623 Zinc Sulfide - Zinc Cadmium Sulfide Suspension at 12.8 mg./cc.
 - P69B 1-N Potassium Sulfate (1/2M), Purified.
 - P264D 16% Potassium Silicate, Purified.
 - W7K Distilled, W7J Distilled, or W60D Deionized Water.
 - A609 Ammonium Bifluoride or H7 Hydrofluoric Acid.



AMMONIUM BIFLUORIDE SAFETY PRECAUTIONS: See 33-2-7C
HYDROFLUORIC ACID SAFETY PRECAUTIONS: See 33-2-7A

3. PROCEDURE

- a. Rinse bulbs with distilled or deionized water.
- b. Place bulbs on dispensing table on blocks or trays or in multiple-unit bulb holders:
- c. Apply screen material (See part 4).
 - (1) Add cushion layer, if any, to bulb through an open funnel with 325-mesh stainless steel strainer insert.
 - (2) Prepare settling suspension as given for specific tube type.
 - (3) Add settling suspension to bulb through appropriate funnel fitted with 325-mesh strainer.
 - (4) Allow screen to settle specified time.
 - (5) Pour off clear solution - pouring time 6-8 minutes.
 - (6) Wash neck with tap water.
 - (7) Air dry 3-4 minutes.
 - (8) Wash neck and face plate of 5FP4A, 7CP4 and 7QP4 bulbs with 0.5-1.0% hydrofluoric acid, then wipe with cloth dampened with tap water. Use 3-3.5% ammonium bifluoride solution for 3KP4 bulbs.
 - (9) Alternate bulb cleaning process see 34-17-4P.

4. SCREEN APPLICATION SPECIFICATIONS

Tube Type	Fluorescent Material mg.	Screen Weight mg./cm ²	Cushion Water cc.	Z623 at 12.8 mg/cc. cc.	Silicate 16% cc.	Sulfate 1-N cc.	Suspension Water (cc.)	Total Susp. Volume (cc.)	Suspension per bulb (cc.)	Funnel Type	Settling Time hr.
3KP4 3RP4	103	2.5	0	128	128	240	1904	2400	150	Open	1-1/2-3
5FP4A	424	4.0	100	33	24	50	193	300	300	Open	1-1/2
7CP4	768	3.0	640	60	67	138	196	461	461	10B	1-3/4
7QP4	896	4.0	400	70	48	100	192	410	410	10B	1-1/2
5AYP4	371	3.5	100	29	24	50	197	300	300		1-1/2

End of Schedule No. 2A.

7-552-22-60

PCI26978-126JR

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SUBJECT: **SETTLING P4 FLUORESCENT SCREENS**
 Process Specifications

SUPERSEDES Oct. 15, 1954

SCHEDULE NO. 2E (P402 Screen by Settling Belt)
 (Lancaster Barium Acetate Process)

- 1. **EQUIPMENT** As specified in 34-17-14.
- 2. **MATERIALS**
 - * Z359A Phosphor Suspension at 25.0 mg/cc
 - B251A Barium Acetate Solution (Electrolyte)
 - A609 Ammonium Bifluoride, or H7 Hydrofluoric Acid
 - W7K Distilled, W7J Distilled, or W60D Deionized
 - * P264D Potassium Silicate Solution (Binder)



AMMONIUM BIFLUORIDE SAFETY PRECAUTIONS: See Std. Not. 33-2-7C
 HYDROFLUORIC ACID SAFETY PRECAUTIONS: See Std. Not. 33-2-7A

3. **PROCEDURE**

- a. When bulb approaches a position vertical to the floor, release the screw clamps with the right hand and support the bulb in the holder with the left hand. Then raise the bulb against the screw button, move the hand supporting the bulb neck upward, lower the body of the bulb and lift free of the holder. Place the bulb on the conveyor.

Remove a clear, clean bulb from the conveyor; grasp the bulb neck with the left hand and raise the bulb so the right hand can support the bulb beneath the metal cone near the face rim. Insert in holder. Turn the screw with the right hand until the bulb holds firmly.

CAUTION: The machine is very sensitive to shocks, jars, bumps, and twisting motions applied at the loading point. Every motion is carried to the pour-off end of the machine where ripples created on the surface of the liquid will cause machine lines. It is important that every movement of the bulb in contact with the bulb holder be the least possible and accompanied by as little momentum as possible. If the operation is started at the vertical loading point, there will be sufficient time to do a good loading job on each bulb.

- b. Dispensing
 Dispense cushion layer at loading position after bulb has been secured to settling belt.

Tube Type	B251A	Water	Total Cushion
§10BP4A	175 cc	1985 cc	2160 cc
§12LP4A	240 cc	4800 cc	5040 cc
→ ***			
§14EP4/14CP4, 14HP4	200cc	3820 cc	4020 cc
→ ***			
→ ***			
§16RP4/16KP4	388 cc	7770 cc	8158 cc
§16TP4	388 cc	7770 cc	8158 cc

§ Types can be run at either 9.5 or 11.5 inches/minute belt speed.

(Cont'd on next page.)

SCALE— DIMENSIONS IN UNLESS OTHERWISE SHOWN. DIMENSIONS SHOWN WITHOUT TOLERANCES ARE DESIGN CENTERS

5-552-11-80 PCM433-802PB



SUBJECT:

SETTLING P4 FLUORESCENT SCREENS
Process Specifications

SUPERSEDES June 28, 1954

SCHEDULE NO: 2E (P402 Screens by Settling Belt) (Cont'd)

3. PROCEDURE (Cont'd)

b. Dispensing (Cont'd)

Dispensing cushion layer at loading position after bulb has been secured to settling belt.

<u>Tube Type</u>	<u>B251A</u>	<u>Water</u>	<u>Total Cushion</u>
17BP4A	400 cc	8036 cc	8436 cc
17HP4/17RP4	400 cc	8036 cc	8436 cc
17QP4	400 cc	8036 cc	8436 cc

Dispense phosphor suspension, silicate and water into each bulb after blub has reached vertical position below dispenser tank. Cycling is as indicated with a six second pause between silicate and phosphor dispensing. Entire dispensing volume is to be introduced into bulb through a funnel containing a stainless steel insert with 200 mesh stainless screen.

<u>Tube Type</u>	<u>Silicate</u>	<u>Phosphor Suspension</u>	<u>Water</u>	<u>Total Dispensing Volume</u>	<u>Total Bulb Volume</u>
10BP4A	75 cc	87 cc	330 cc	492 cc	2652 cc
12LP4A	92 cc	137 cc	453 cc	682 cc	5722 cc
14EP4/14CP4 14HP4	77 cc	123 cc	603 cc	803 cc	4823 cc
16RP4/16KP4	148 cc	161 cc	677 cc	986 cc	9144 cc
16TP4	148 cc	161 cc	677 cc	986 cc	9144 cc
17BP4A	152 cc	185 cc	778 cc	1115 cc	9551 cc
17HP4/17RP4	152 cc	185 cc	778 cc	1115 cc	9551 cc
17QP4	152 cc	185 cc	778 cc	1115 cc	9551 cc

The water is to be divided proportionately between the silicate and phosphor phases so that the silicate is rinsed well and sufficient head and rinse be present in the phosphor phase.

c. Drying: Vacuum or Air Drying.

d. Settling Time: Belt speed 9.5 inches/minute.

End of Schedule No. 2E

→ * General Revision

SCALE—

DIMENSIONS IN

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DIMENSIONS SHOWN WITHOUT TOLERANCES ARE DESIGN CENTERS

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6-552-11-80

PCM433-802PB



SUBJECT: **SETTLING P4 FLUORESCENT SCREENS**
Process Specifications

SCHEDULE NO: 2F (P402 Screen by Bay Settling)
(Lancaster Barium Acetate Process)

1. **EQUIPMENT** As specified in 34-17-14
2. **MATERIALS**
- Z359A Phosphor Suspension at 25.0 mg/cc
 - B251A Barium Acetate Solution (Electrolyte)
 - A609 Ammonium Bifluoride, or H7 Hydrofluoric Acid
 - W7K Distilled, W7J Distilled, or W60D Deionized Water
 - P264D Potassium Silicate Solution. (Binder)



AMMONIUM BIFLUORIDE SAFETY PRECAUTIONS: See Std. Not. 33-2-7C
HYDROFLUORIC ACID SAFETY PRECAUTIONS: See Std. Not. 33-2-7A

3. **PROCEDURE**

- a. Remove clean bulb from conveyor and place bulb face down on the two position moveable dolly under dispenser. Dispense:

<u>Tube Type</u>	<u>Ba(Ac)2</u>	<u>Water</u>	<u>Total Cushion</u>
10BP4A	175 cc	1985 cc	2160 cc
12LP4A	240 cc	4800 cc	5040 cc
14EP4/14CP4, 14HP4	200 cc	3820 cc	4020 cc
16RP4/16KP4	388 cc	7770 cc	8158 cc
16TP4	388 cc	7770 cc	8158 cc
17BP4A	400 cc	8050 cc	8436 cc
17HP4/17RP4	400 cc	8036 cc	8436 cc
17QP4	400 cc	8036 cc	8436 cc

- b. Transfer bulb to settling table or tilt table.
- c. The following phosphor suspension, silicate and water is dispensed into a suitable flask (5U bulb), and added to the bulb not sooner than 6 minutes after bulb was placed on settling table or tilt table.

+ * General Revision

(Cont'd on next page)

SCALE—

DIMENSIONS IN

UNLESS OTHERWISE SHOWN.

DIMENSIONS SHOWN WITHOUT TOLERANCES ARE DESIGN CENTERS

7-552-11-80 PCM433-802PB

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SUBJECT: **SETTLING P4 FLUORESCENT SCREENS**
Process Specifications

SUPERSEDES July 1, 1954

3. PROCEDURE (Cont'd)

<u>Tube Type</u>	<u>Silicate</u>	<u>Phosphor Suspension</u>	<u>Water</u>	<u>Total Dispensing Volume</u>	<u>Total Bulb Volume</u>
10BP4A	75 cc	87 cc	330 cc	492 cc	2652 cc
12LP4A	92 cc	137 cc	453 cc	682 cc	5722 cc
14EP4/14CP4 14HP4	77 cc	123 cc	603 cc	703 cc	4823 cc
16RP4/16KP4	148 cc	161 cc	677 cc	986 cc	9144 cc
16TP4	148 cc	161 cc	677 cc	986 cc	9144 cc
17BP4A	152 cc	185 cc	778 cc	1115 cc	9551 cc
17HP4/17RP4	152 cc	185 cc	778 cc	1115 cc	9551 cc
17QP4	152 cc	185 cc	778 cc	1115 cc	9551 cc

d. Settling time 40 to 50 minutes.

e. Pour off through 180°, remove carefully from tilt table and rinse neck.

f. Drying: Air or vacuum drying.

→ * General Revision

SCALE—

DIMENSIONS IN

UNLESS OTHERWISE SHOWN.

End of Schedule No. 2F

DIMENSIONS SHOWN WITHOUT TOLERANCES ARE DESIGN CENTERS

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8-552-11-80

PCM433-802PB



SUBJECT: SETTLING P4 FLUORESCENT SCREENS
Process Specifications

SCHEDULE NO. 4 (P404 Screens)
(Initially for 5TP4-LA31)

1. EQUIPMENT As specified in 34-17-14.
2. MATERIALS
 - Z12C Zinc Beryllium Silicate Suspension
 - C629 Calcium Magnesium Silicate Suspension
 - P69B 1-N Potassium Sulfate (M/2), Purified §
 - *P264D 16% Potassium Silicate, Purified §
 - W7K Distilled, W7J Distilled, or W60D Deionized Water
(at room temperature) §
 - *B610D Isobutyl Methacrylate Lacquer
 - H7 Hydrofluoric Acid
 - A609 Ammonium Bifluoride
§ Filter through a porous stainless steel filter
having 35 micron pores.

HYDROFLUORIC ACID SAFETY PRECAUTIONS: See 33-2-7A
AMMONIUM BIFLUORIDE SAFETY PRECAUTIONS: See 33-2-7C



3. PREPARATION OF P404 SCREEN MATERIAL

- a. Empty stock solution of Z12C and C629 into agitator jars or tanks and agitate for at least 15 minutes.
- b. Determine concentration of each component by filtering a 20 or 25 cc. sample of each suspension through a weighed (± 1 mg.) Gooch crucible, drying at 110°C . for at least 1-1/2 hours, and reweighing.

$$\text{Concentration of Material} = \frac{\text{Wt. or Residue \& Crucible} - \text{Wt. of Crucible}}{\text{Volume of Sample}}$$

- c. Using concentrations determined for each component, make up a sample batch (2000 cc.) at current blending percentages and at a concentration of 10 mg./cc.
- d. Place test batch in an agitator jar and settle at least twelve bulbs for color check. Pour, dry, bake, and spark check using standard color sample bulb as screen color comparison.
- e.
 - (1) If color of test batch is not satisfactory, vary the percentages of the blue and yellow components, blend a new batch, and check color as above.
 - (2) If color of test batch is satisfactory at spark check, the bulbs shall be made into tubes.
- f. Check finished tubes for color, screen burning, and light output.
 - (1) Measure color by use of the double-cell on at least 5 tubes at 600 foot-lamberts screen brightness and 27KV Eb2.
 - (2) Check for screen burn on at least one tube:
 - (a) Operate tube with focused monoscope pattern at $200\mu\text{a}$ Ib2 and 27KV Eb2 for 5 minutes. Then examine with a blank raster for burning and measure light output.
 - (b) Continue use of monoscope pattern at above conditions for 40 additional minutes. Re-examine for burning and light output.

SCALE—

DIMENSIONS IN

UNLESS OTHERWISE SHOWN.

DIMENSIONS SHOWN WITHOUT TOLERANCES ARE DESIGN CENTERS

13-551-28-60

PCL26694-126JR

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SETTLING P4 FLUORESCENT SCREENS

SUBJECT: Process Specifications

SCHEDULE NO. 4 (P4O4 Screens)(Cont'd)

3. PREPARATION OF P4O4 SCREEN MATERIAL (Cont'd)

- g. (1) If the color is not satisfactory the material is to be reblended.
- (2) If the color is satisfactory, blend the remainder of the stock solution in the same proportions as used for the test batch. This material should be stored in 4-liter glass-stoppered Pyrex bottles.
- h. All bottles should be placed in shaker for at least 5 minutes before using.

4. PROCEDURE

- a. Rinse bulbs with distilled or deionized water and allow to drain.
- b. Paint faceplate with B610D lacquer to form a protective layer on faceplate surface.
- c. Place bulbs on settling table in perpendicular position.
- d. Measure the following materials into a 3-liter Florence flask. For 6 bulbs at 2.5 mg./cm² use:

	189cc.	Blend of Z12C & C629 Suspensions at 10 mg/cc.
	170cc.	Distilled or Deionized Water to rinse Phosphor graduate
→	* 252cc.	Potassium Silicate (16%)
	570cc.	Potassium Sulfate (1-N)
→	*1669cc.	Distilled or Deionized Water (Room Temperature ±2°C)
	<u>2850cc.</u>	Total Settling Suspension for 6 bulbs.

- e. Shake flask vigorously and pour 475cc. of above settling suspension into a graduate.
- f. Add contents of graduate to bulb through an open-end funnel equipped with 325-mesh stainless steel strainer insert. Tip of funnel should extend just below bulb reference line.
- g. Allow screen to settle at least 3 hours.
- h. Pour off clear solution - pouring time 6-8 minutes.
- i. Air dry 3-4 minutes.
- j. Bulb cleaning
 - (1) Wash neck with 0.5 - 1.0% hydrofluoric acid - rinse with water.
 - (2) Bulbs with film on faceplate.
 - (a) Clean face plate with wet sponge (clean water).
 - (b) Remove remaining silicate by rubbing with dry steel wool.
 - (3) Baked bulbs (returned after inspection)
 - (a) Wipe face with concentrated (approx. 20-25%) Ammonium bifluoride on sponge.
 - (b) Wipe with wet clean sponge.
 - (c) Wipe with damp, clean sponge.
 - (d) Dry with paper towel.
 - (e) Use steel wool and bifluoride on any silicate remaining.

SCALE—

DIMENSIONS IN

UNLESS OTHERWISE SHOWN.

DIMENSIONS SHOWN WITHOUT TOLERANCES ARE DESIGN CENTERS

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SUBJECT: **SETTLING P4 FLUORESCENT SCREENS**
Process Specifications

SCHEDULE NO. 5 (P405 Screens)
 (Initially for 7NP4 at a density of 8 mg./cm²)

1. **MATERIALS:**
- Z617 Zinc Sulfide Suspension (Z614 Phosphor)
 - Z12C Zinc Beryllium Orthosilicate Suspension (Z5C Phosphor)
 - C629 Calcium Magnesium Silicate Suspension (C628 Phosphor)
 - P69B Potassium Sulfate Solution, 1N
 - * P264D Potassium Silicate Solution, 16%
 - W7K 1 Distilled Water

2. **PROCEDURE**

All bulbs must have plastic coating on faceplate before settling, according to operations on complete bulb assembly.

- a. Fill space between necks with distilled water.
- b. Add first cushion layer to bulb.

250cc. 1N Potassium Sulfate Solution
 460cc. Distilled Water

- c. Add first layer, single component settling suspension.

42cc. Zinc Sulfide Suspension Z617 at 10 mg./cc.
 * 100cc. 16% Potassium Silicate Solution
 350cc. Distilled Water.

- d. Settle for 3 hr. minimum, pour off clear solution (pouring time 10 min.); rinse neck with running water only, vacuum dry.
- e. Fill space between necks with water.
- f. Add second cushion layer to bulb.

250cc. 1N Potassium Sulfate Solution
 460cc. Distilled Water

- g. Add second layer, double component settling suspension.

69cc. Blend of Zinc Beryllium Orthosilicate and Calcium Magnesium Silicate at 20 mg./cc. (The two components are milled separate. Suspensions are then blended to the correct color ratio at 20 mg./cc.).
 * 120cc 16% Potassium Silicate Solution.
 350cc. Distilled Water.

- h. Settle for 3 hr. minimum, pour off clear solution (pouring time 10 min.); rinse neck with running water only, vacuum dry and bake 15 min. at 350°C.

NOTE: Cushion layers and settling suspensions shall be 1-2°C. below room temperature when added to bulb.

- i. Inspect screens at lite box according to S.N. 25-9-1.

End of Schedule #5.

SCALE—

DIMENSIONS IN UNLESS OTHERWISE SHOWN. DIMENSIONS SHOWN WITHOUT TOLERANCES ARE DESIGN CENTERS

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